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GROUP 2800

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/514,250
Filing Date: February 28, 2000
Appellant(s): CHOI ET AL.

Daniel Kim
Reg. No. 36,186
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed April 9, 2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that claim group 19-25, 65, 71, 77, and 79, claim group 61, 67, 78, claim group 62-64, 68-70, and 74-76, claim group 66, 72, 80 and claim group 73 and 81do not stand or fall together and the claims *within* each group do stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

4,776,681	MOSKOVICH	10-1988
5,982,544	OTAGA	11-1999
5,838,496	MARUYAMA ET AL	11-1998

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 19-25 and claims 61-63, 65-69, 71-75 and 77-82 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Moskovich (PN. 4,776,681) in view of the patent issued to Ogata et al (PN. 5,982,544).

Moskovich teaches a projection lens for cathode ray tubes (CRT) having a *first lens* with positive refractive power in the center and negative refractive power on the peripheral, (G1, pleases see column 6, lines 6-11), a *second lens* of positive refractive power, (G2, please see column 18, lines 12-14), and a *third lens* of positive refractive power (CR) and a *fourth lens* of negative refractive power, (G3, please see Figures 2-3). Moskovich teaches that the surfaces of the first lens, third lens and the fourth lens may include *aspherical surfaces*, (please see Table II, III and X). This means, (with respect to amended claim 20), that the first, third and fourth lenses are each designated to have an aspherical surface, (please see Table II, III and X).

This reference has met all the limitations of the claims with exception that it does not teach to include a diffractive optical element formed on at least one surfaces of said lenses. **Ogata** in the same filed of endeavor teaches to use a refractive lens/diffractive surface combination in particularly a diffractive optical element that formed on an aspherical lens to correct the **aberrations,** including chromatic aberrations, of the lens system, (please see column 3, lines 11-35, column 10, lines 16-19, 45-

47). With regard to claim 21, Ogata teaches that achromatic correction can be achieved by making one of the surface of a lens an aspherical surface and the other surface with diffractive surface, (please see column 8, lines 18-21). With regard to claims 23-24, the diffractive surface comprises a plurality of recesses forming concentric circles with rotational symmetry, (please see the equation (b) for forming the concentric rings of recesses, also please see column 2, lines 10-31) and as demonstrated in Figure 3 and by the equation (b) the pitch of the rings are decreasing from the center to the peripheral of the diffractive surface. With regard to claim 25, Ogata teaches that the diffractive/aspherical lens may be made of plastic. It would then have been obvious to one skilled in the art to apply the teachings of Ogata to form a diffractive optical element either on at least one surface of the lenses or on a surface of an aspherical lens of the lens system of Moskovich for the benefit of more effectively correcting the aberrations, (both spherical and chromatic aberrations), in the projection lens system, to provide good image quality for the cathode ray tube utilizing the projection lens system.

With regard to claims 61, 67 and 78, Moskovich teaches that the aspherical lens surfaces are designed by the aspherical lens formula (also known as the sag equation) as stated in column 5 and line 30-35 with "K" stands for conic constant, "C" stands for curvature of the lens and aspherical coefficients for the polynomial of different power of height "r" measured from the optical axis. Moskovich teaches that surface for the first lens S1, the surface for the third lens S5 and S6, and the surface for the fourth lens S7 are of spherical surfaces, (please see Tables II, III and X), wherein each can be described by the aspherical lens formula.

With regard to claims 62, 68 and 74, these references do not teach *explicitly* that the fourth lens and the diffractive optical element have chromatic dispersion characteristics opposite to each other. However the idea of using diffractive optical element to correct chromatic aberration is to have the chromatic dispersions created by the diffractive element and the lens element, intended to be corrected, being opposite to each other, (please see the explicit teachings of such in column 3, lines 18-22 of Ogata).

Such feature is therefore inherently met by the disclosure of Ogata since the chromatic dispersion characteristics, such as the sign or direction of the dispersion, is *opposite* between the chromatic dispersion of a refractive lens, such as the fourth lens, and of a diffractive optical element.

With regard to claims 63, 69 and 75, Moskovich teaches that third lens which is a corrector lens for correcting the aberrations of the lens system. Although this reference does not teach explicitly that the correction includes chromatic aberration, Ogata in the same field of endeavor teaches that diffractive optical element may be added to lens surface to correct chromatic aberration of the lens system, (please see column 5, lines 35-38). It would then have been obvious to one skilled in the art to apply the teachings of Ogata to add diffractive optical element to the corrector lens for the benefit of providing chromatic aberration correction to the lens system to improve the image quality of the CRT.

With regard to claims 65, 71 and 79, the projection lens system of Moskovich teaches the same lens structure combination, which therefore also does not require additional lenses having negative refractive power to enlarge the dispersion of a beam.

With regard to claims 66, 72, and 80, Moskovich teaches that the second lens has the majority of the refractive power, (please see column 18, lines 12-14). The correction of aberrations therefore is mainly directed to the aberration created by the second lens. Furthermore, for the reasons stated above, one skilled in the art would apply the teachings of Ogata to provide a diffractive surface to more effectively correct the aberrations, (please see column 5,lines 35-38).

With regard to claims 73 and 81, Moskovich teaches that the first, third and fourth lenses are each designed to have an aspherical surface, which *implicitly* have the function of correcting spherical aberrations, (please see Table II). It is therefore implicitly true that these lenses work in conjunction with others, such as the second lens, to reduce the spherical aberrations since Moskovich does teach that the projection lens system, including all of the lenses, is capable of correcting spherical aberrations.

With regard to claims 77 and 82, Moskovich teaches the projection lens has overall positive power. The projection lens of Moskovich in combination with the teachings of Ogata has the function of correcting the chromatic aberrations.

Claims 64, 70 and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Moskovich and Ogata as applied to claims 19, 67 and 74 above, and further in view of the patent issued to Maruyama et al (PN. 5,838,496).

The projection lens system of **Moskovich** in combination of the teachings of **Ogata** as described for claims 19, 67 and 74 have met all the limitations of the claims. Ogata teaches explicitly that diffractive optical element is added to lens surface to correct chromatic aberrations of the lens system. Although these references do not teach explicitly about the claimed color dispersion properties of the lens and the diffractive optical element, these dispersion properties are standard properties for diffractive optical element and refractive optical element, as demonstrated by the teachings of **Maruyama et al**. Maruyama et al teaches that due to chromatic aberration (or dispersion), the refractive lens function causes the light of shorter wavelength (such as blue light as compared to red light) moves toward the lens (i.e. closer to the lens or with a shorter focal length). The diffractive lens function on the other hand causes the light of shorter wavelength (such as blue light as compared to red light) moves away (i.e. further from the lens or with a longer focal length). The combination of the refractive lens function and diffractive lens function with opposite chromatic dispersion properties will reduce or cancel the chromatic aberrations caused by the lenses, (please see column 3 line 55 to column 4, line 9).

Double Patenting

A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ...

may obtain a patent therefore ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

Applicant is advised that should claims 61 and 62 be found allowable, **claims 67 and 74 will be objected** to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

(11) Response to Argument

A. **35 U.S.C. 112, first paragraph**

In view of appellant's arguments present in the appeal brief, the rejections of claims 63, 69 and 75, under 35 USC 112, first paragraph, for failing to comply with the written description requirement for added new matters, are **withdrawn**, because the appellant has argued the "third lens" claimed in claims 63, 69 and 75, really means "a *plastics* lens (i.e. a refractive lens) having a positive refractive power **and** the diffractive optical element", (please see page 9 of the brief and page 16, lines 2-20 of the specification).

B. 35 U.S.C. 103(a)

1. Independent Claim 19

In response to appellant's arguments which state that there is no motivation to one of ordinary skilled in the art to modify the cited Moskovich's lens system to include a diffractive optical element

because Moskovich's system addresses and corrects aberrations without any need for additional parts and any additions to the system would either be redundant or could destroy or hurt Moskovich's system, and there is no other motivation (beside correcting aberrations) for combining the Moskovich and Ogata references, the examiner respectfully disagrees for the reasons stated below.

Moskovich's lens system indeed includes a corrector lens (CR) for correcting aberrations and it permits "*better* correction for aberrations due to off-axis rays", (please see column 4, lines 31-34), however no where in Moskovich's reference ever states that the correction is complete, (as suggested by the appellant), and therefore no additional element can be added to *improve* the aberrations correction. In fact, one of ordinary skill in the art would understand that it is not possible to completely correct the aberrations in a lens system. Furthermore, Moskovich reference teaches to correct aberrations, and explicitly teaches that corrector lens is designed to correct the *spherical* aberrations of the lens system, (please see column 7, lines 52-59), but does not specifically identify that other types of the aberrations are being corrected by the corrector lens. One of ordinary skill in the art would understand there are at least two types of aberrations associated with a lens system, one is *spherical* aberrations, which is due to lens elements having a spherical shape, and one is *chromatic* aberrations, which is due to the lens system having different focal lengths for different wavelengths of the light. Aberrations, by definition, means deviation from normal, when these occur in a lens system, it will cause the lens system to either not form a sharp image (particularly for spherical aberrations) or to have a fuzzy image with unnatural colors, (particularly for chromatic aberrations). It is known in the art that both types of aberrations are inherent in a lens system since they are the results of lens configuration and lens materials, (please note Moskovich teaches that the lenses can be made of glass material which as is known in the art would give rise chromatic aberrations, column 16, line 67). Moskovich teaches that the lens system is a projection lens for a cathode ray tube, this means the image quality, both sharpness and color correctness, is important. It is a common practice in the art to use aspherical lens surfaces to correct spherical aberrations, (please note

that Moskovich teaches the corrector lens has aspherical surfaces (S5 and S6 for Table II, III and X etc.), and to use either positive/negative refractive power lens or refractive/diffractive hybrid lens to correct the chromatic aberrations, (please see column 5 liens 35-46 of Ogata). While it is understandable that the spherical aberrations can be corrected by the aspherical surfaces of the corrector lens of Moskovich, the correction of chromatic aberrations (which is inherently present in the lens system) by the corrector lens is not clearly stated. Even if the corrector lens of Moskovich corrects the chromatic aberrations of the lens system, it does not prevent one of ordinary skill in the art from further modifying the lens system to **improve** the aberrations correction, in particularly the chromatic aberrations, if other means for doing so is available in the art. In particular, the cited **Ogata** reference teaches **explicitly** that a diffractive surface, based on the law of diffraction, has two important features when used in the form of a lens, one is *aspherical* action and the other is the *dispersion* (i.e. different deflection angles for light of different wavelength) which is very large and *negative or opposite* in dispersion characteristics as compared to an ordinary refractive lens (made of glass or plastic materials). The chromatic aberrations of the diffractive surface is several tens times as large as that of a conventional *glass* material for making ordinary lens and are with *minus sign* or in the *opposite direction* with respect to conventional refractive lens. This means that the dispersion or the chromatic aberrations of a diffractive surface has a *cancellation* effect to the chromatic aberrations of an ordinary refractive lens, and the aspherical action of the diffractive surface has the effect for correcting spherical aberrations, (please see column 3, lines 11-35 of Ogata). Ogata further teaches that by using ordinary refractive lenses with positive and negative power to correct chromatic aberrations, both of the lenses are required to have strong power and therefore resulting thickness increases of both lenses. However by using the combination of diffractive surface with a refractive lens, it is unnecessary to increase the power of the lens and therefore unnecessary to increase the thickness of the lenses. It is additionally unnecessary to increase the number of the parts involved since the diffractive surface can be formed on a surface of a lens, (please see column 5, lines 35-47 and

column 6, lines 9-19). By using a diffractive surface on a refractive lens, or known as a refractive/diffractive hybrid lens both the spherical and chromatic aberrations of a lens system can be effectively corrected without increasing the number and thickness of the lenses.

One of ordinary skill in the art would therefore certainly be motivated to apply the teachings of Ogata to add a diffractive surface to one of the surfaces of the lens elements of Moskovich's system to make it a refractive/diffractive hybrid lens for at least the purpose of allowing the hybrid lens to be able to correct **both** the spherical aberrations and the chromatic aberrations yet without increasing the power or thickness of the hybrid lens and therefore cutting the cost of the lens system, and such correction will ensure a good image quality, both sharpness and color correct, for the cathode ray tube.

In response to appellant's arguments which state that by simply addition of a diffractive optical element could introduce new aberrations and simple substitution would require additional consideration to find new lens elements to provide the power of the original corrector lens while also having to work in conjunction with a diffractive optical element, and the addition of diffractive optical element into Moskovich system would not be obvious and would not provide any additional optical benefits but rather may create its own problems and aberrations, the examiner respectfully disagrees for the reasons stated below.

Ogata teaches explicitly that the diffractive surface can be designed to have aspherical action namely to have *optical power* for converging light to a point, (please see column 3, lines 11-16), it therefore does not need additional lens element to provide the optical power of the original corrector lens and this aspherical action is enabling the diffractive surface to correct the spherical aberrations as of the original corrector lens. The diffractive surface indeed introduces aberrations, which is chromatic aberrations, however as commonly known in the art and as explicitly taught by Ogata, the chromatic aberrations introduced by the diffractive element actually is opposite to the chromatic aberrations introduced by other refractive lens elements in the lens system, it therefore can be designed to cancel the

chromatic aberrations of the lens system, and to improve the correction of aberrations of the lens system. It is known in the art that the refractive power of a *refractive* lens depends on the thickness of the lens as well as the refractive index of the lens material. The dispersion of a refractive lens also depends on the refractive index of the lens material. The index of refraction of a material in general is a function of wavelength that causes different wavelength of the light to be refracted at different angle, (it is based on Snell's law). However for a *diffractive* surface, both the optical power and the dispersion property are based on laws of diffractions and is a function of the *diffraction grating characteristics*, such as the pitch of the grating lines, (please see column 2, lines 11-27 of Ogata). The diffractive surface therefore can be designed to have a *grating structure* that provides **both** the optical power and the dispersion property to correct both the spherical and chromatic aberrations, without worrying about the thickness of the lens elements and without worrying about the specific material needed (such as specific refractive indices combination) to be used to as in an ordinary refractive lens system to correct the aberrations. This addition or substitution will therefore not create new problems and will not destroy the lens system of Moskovich rather one of ordinary skill in the art would be motivated to make one of the lenses of Moskovich a refractive/diffractive hybrid lens for the optical benefit of correcting *both* the spherical and chromatic aberrations of the lens system with a thinner lens design. There are certainly optical benefits by introducing a diffractive surface to the lens system of Moskovich.

In response to appellant's arguments which state that the cited Ogata discloses a camera lens system using six lenses which is not a *thinner* lens design as the instant application, the examiner respectfully disagrees for the reasons stated below. The Ogata reference is relied upon to provide the teachings of using **a** refractive lens and **a** diffractive surface, with the diffractive surface formed on one of the surfaces of the refractive lens, and then making a *thin* single lens design to correct aberrations. The number of other lens elements used in the whole camera system, which are designed for other optical functions, is not relevant here, since it does not affect the teaching of adding a diffractive surface to a

refractive lens to correct the aberrations. Furthermore, the claims do not claim to limit the number of the lenses to be four and the limitations concerning "thinner lens design" is not explicitly stated in the claims.

The teachings of cited Moskovich in combination with the teachings of Ogata therefore meet the four lens system with a diffractive element formed on one of the lens surfaces, as recited in claim 19.

2. Independent claim 67

Appellant's arguments concerning the cited Moskovich reference in combination with the cited Ogata reference have been fully addressed in the arguments present for claim 19 above.

In response to appellant's arguments which states that the sag equation for describing an aspherical surface recited by Moskovich reference includes a coefficient corresponding to the fourteenth order, while the sag equation disclosed in claim 67 does not include the fourteenth order, thus the *shape* of the first, third and fourth lenses of claimed invention are different from the shape of the first, third and fourth lenses of the cited Moskovich reference, the examiner respectfully disagrees for the reasons stated below.

It is known in the art that the sag equation is used to describe an aspherical *surface* of a lens not a bulk shape of the lens, the term "shape" here therefore is referred to the aspherical surface. The aspherical surface is theoretically *approximated* by mathematical polynomial series expansion, (known as the sag equation), in terms of the height r of the surface measured from an optical axis, and *theoretically* the series expansion is up to infinite order of r, to be exact. The higher and more of the orders of r being included in the sag equation will more **accurately describe** the aspherical surfaces in mathematical term. The aspherical surface has a *shape* that is always *aspherical,* whether it is described by the sag equation up to twelfth or fourteenth orders, it is still an aspherical shape. The inclusion of higher orders *does not* change the shape of the surface just provides a *more accurate description* of the surface. The *aspherical* surfaces of the first, third and fourth lenses of Moskovich therefore are not different from the *aspherical*

surfaces of the first, third and fourth lenses of the instant application, for they all are of *aspherical* shape. Furthermore, since the claim of the instant application *fails* to provide the exact numerical values for the coefficients in the sag equation, there is no other shape besides an aspherical shape being defined here and therefore it cannot be different from the aspherical shape of the lenses of the cited Moskovich reference. Moskovich teaches that the coefficient for the fourteenth order is of the order of 10^{-22} (please see Tables II, III and X for coefficient I), and it is one thousandth of the twelfth order. It is questionable that by including the fourteenth order of the sag equation will make the "shape" of the aspherical surface so different. Moskovich teaches that surfaces for the first lens S1, the surface for the third lens S5 and S6, and the surface for the fourth lens S7 are of aspherical surfaces, (please see Tables II, III and X), and they are therefore not different from the first, third and fourth lenses of the instant application.

3. Claim 62

In response to appellant's arguments which state that claims 62-64, 68-70, and 74-76, require "a projection lens system with chromatic dispersion characteristics being corrected by either the combination of the fourth lens and a diffractive optical element or by the third lens which includes a diffractive optical element", and the cited reference Ogata does not teach such the examiner respectfully disagrees for the reasons state below.

Firstly, *claim 62*, (and claims 68 and 74), states "the fourth lens and the diffractive optical element have chromatic dispersion characteristics opposite to one another", however the claim **does not claim** "a projection lens system with chromatic dispersion characteristics being corrected by the *combination* of the fourth lens and a diffractive optical element". The claims also **fail** to disclose what is considered here to be the "chromatic dispersion characteristics" and it can be therefore broadly interpreted as the *sign* or *direction* of the chromatic dispersion of the fourth lens and the diffractive lens being opposite to each other. Furthermore, the claim **fails** to define the *order* of the lens elements, the only

definite definition for the fourth lens is a lens with *negative* refractive power. *Claims 63, 69 and 75* also **fail** to explicitly state that "a projection lens system with chromatic dispersion characteristics being corrected by the third lens, *which includes a diffractive optical element*". No mention of the diffractive optical element is found in claims 63, 69 and 75. The appellant is respectfully reminded that the limitations that are not recited in the claims cannot be relied upon to overcome the rejections. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

It is known in the art and it is explicitly taught by Ogata that the chromatic dispersion characteristics, such as sign or direction, are opposite to the chromatic dispersion of a refractive lens, (please see column 3, lines 11-35). The chromatic dispersion characteristics of the diffractive surface therefore is implicitly opposite, (in sign and direction), to fourth *refractive* lens. Also the only definition of the "fourth lens" in the instant application is a lens with *negative* refractive optical power. Ogata particularly teaches that the diffractive surface can be formed on a refractive lens of negative refractive power to correct the chromatic aberrations, (please see column 4, lines 1-3, column 5, lines 35-38 wherein the third lens group is of negative refractive power). Furthermore, since the chromatic dispersion of a diffractive surface is always in opposite direction to the chromatic dispersion of a refractive lens, it is implicitly true by forming a diffractive surface on a refractive lens, (such as the third lens, but again the order of the lens is arbitrary) it will force chromatic aberrations to decrease thus enhancing chromatic aberration correction.

The Moskovich reference in combination with the teachings of Ogata references therefore read on claim group 62, (claims 62-64, 68-70, and 74-76).

<u>4. Claim 66</u>

In response to appellant's arguments which states that one of ordinary skill in the art would not look to Ogata to use diffractive optical element in the Moskovich lens system to correct the aberrations, the examiner respectfully disagrees for the reasons state explicitly in the arguments for claim 19 above. In addition, Ogata specifically teaches that a diffractive surface can be formed on the lens that has the worse chromatic aberrations in the lens system in order to correct it, (please see column 5, lines 35-38).

5. Claim 73

In response to appellant's arguments which state that the cited Moskovich fails to disclose or suggest incorporating any further correction device, let alone a diffractive optical element formed on a surface of a lens, which therefore differs from the cited reference, the examine respectfully disagrees for the reasons stated blow.

Claim 73 recites *"said first, third and fourth lenses are each designed to have an aspherical surface, wherein the shape of each of the first, third and fourth lenses is designed to work in conjunction with the others of the first, third and fourth lenses to correct aberrations"*, which is explicitly taught by the disclosure of Moskovich, (please see the aspherical surfaces for first, third and fourth lenses). And since Moskovich teaches that the aberrations are corrected for the projection lens system, this means these lenses have to work in conjunction with other lenses to correct the spherical aberrations in the system, for it is known in the art that aspherical surfaces are mainly used for correcting *spherical* aberrations. The reasons and motivations for applying the teachings of Ogata to include a diffractive surface to have both aspherical action and chromatic aberrations in order to correct both spherical and chromatic aberrations are explicitly disclosed in arguments present for claim 19 above.

C. Double Patenting

Claims 67 and 74 are **objected** with respect to claims 61 and 62, under Double Patenting rejection, for they are duplicating claims. Since the objections to the claims cannot be appealed they therefore are not addressed here.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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